GRADING LARGE NUMBERS OF LIVE SHRIMP FOR MARKING EXPERIMENTS

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MIGRATIONS AND GROWTH OF COMMERCIAL PENAEID SHRIMP currently are being studied by means of mark-recovery experiments which employ biological stains as the marking agents.

Although the size composition of specimens used in such experiments is usually not critical when determining migration patterns, it greatly qualifies the usefulness of data obtained to measure growth rates. As shrimp stained and released in large numbers lose their individual identity, uniform release size is indicated for specimens whose rate of growth is to be determined by this application of the mark-recovery method. The key factor in successfully executing the marking phase of any shrimp-staining experiment is the speed with which experimental animals are captured, graded to size, injected with dye, and released.

This paper describes a method for rapidly sorting large numbers of live shrimp into groups having uniform size composition.

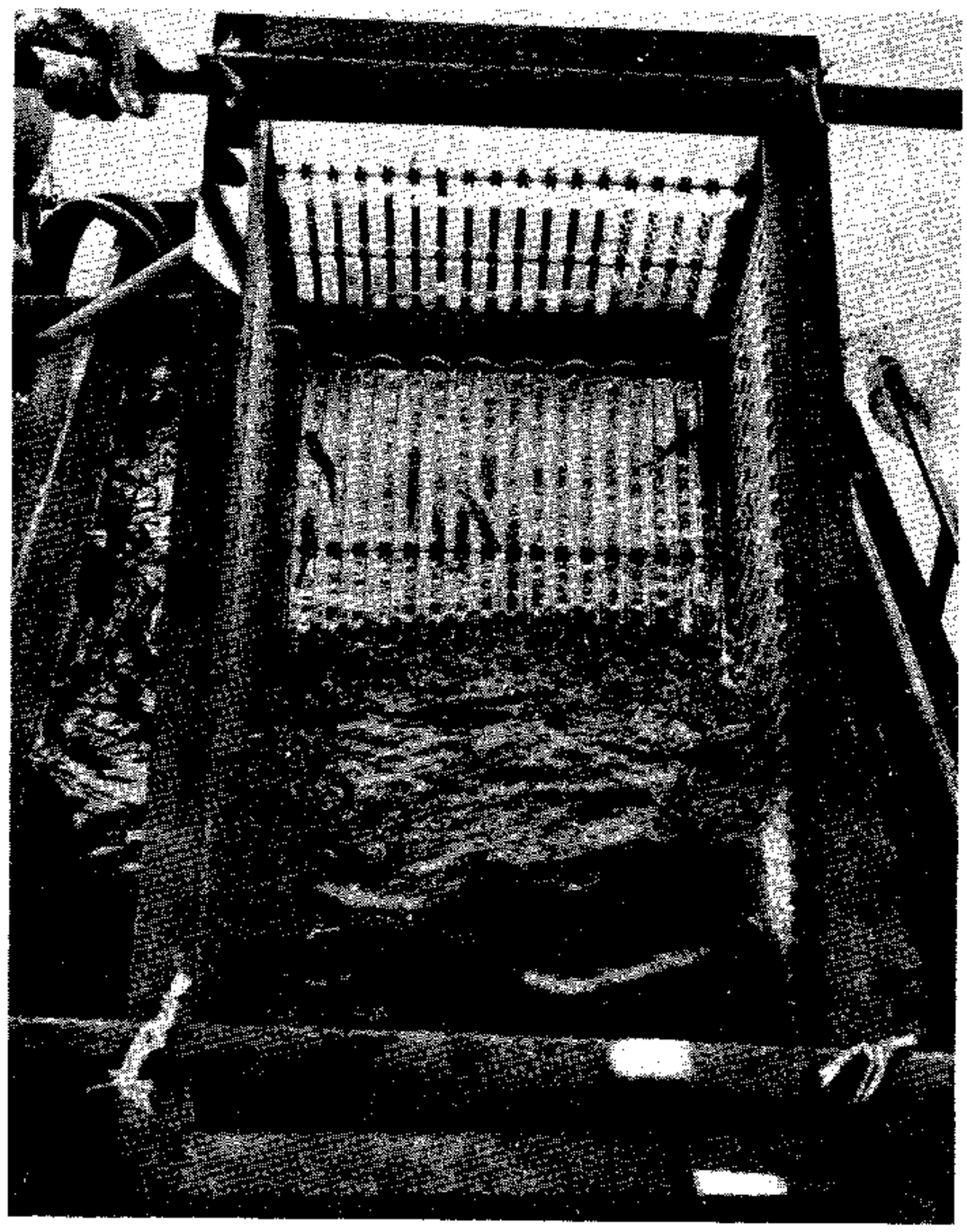

FIGURE 1.--Separator suspended in holding tank.

General Description

This method involves the use of two boxlike separating devices whose sides, ends, and bottoms are composed of Plexiglas tubes, the tube interspaces being readily adjustable (figure 1). Morton (1956) constructed a fish grader of Plexiglas and listed this material's advantages as being light in weight, compatible with animal tissue, resistant to corrosion, and smooth when wet.

A large number of unsorted shrimp are placed in one separator which floats, partly submerged, in the water alongside a dock or boat. Shrimp below the size desired are permitted to escape; those retained are transferred to the second separator, which is suspended in a holding tank of circulating sea water. Those

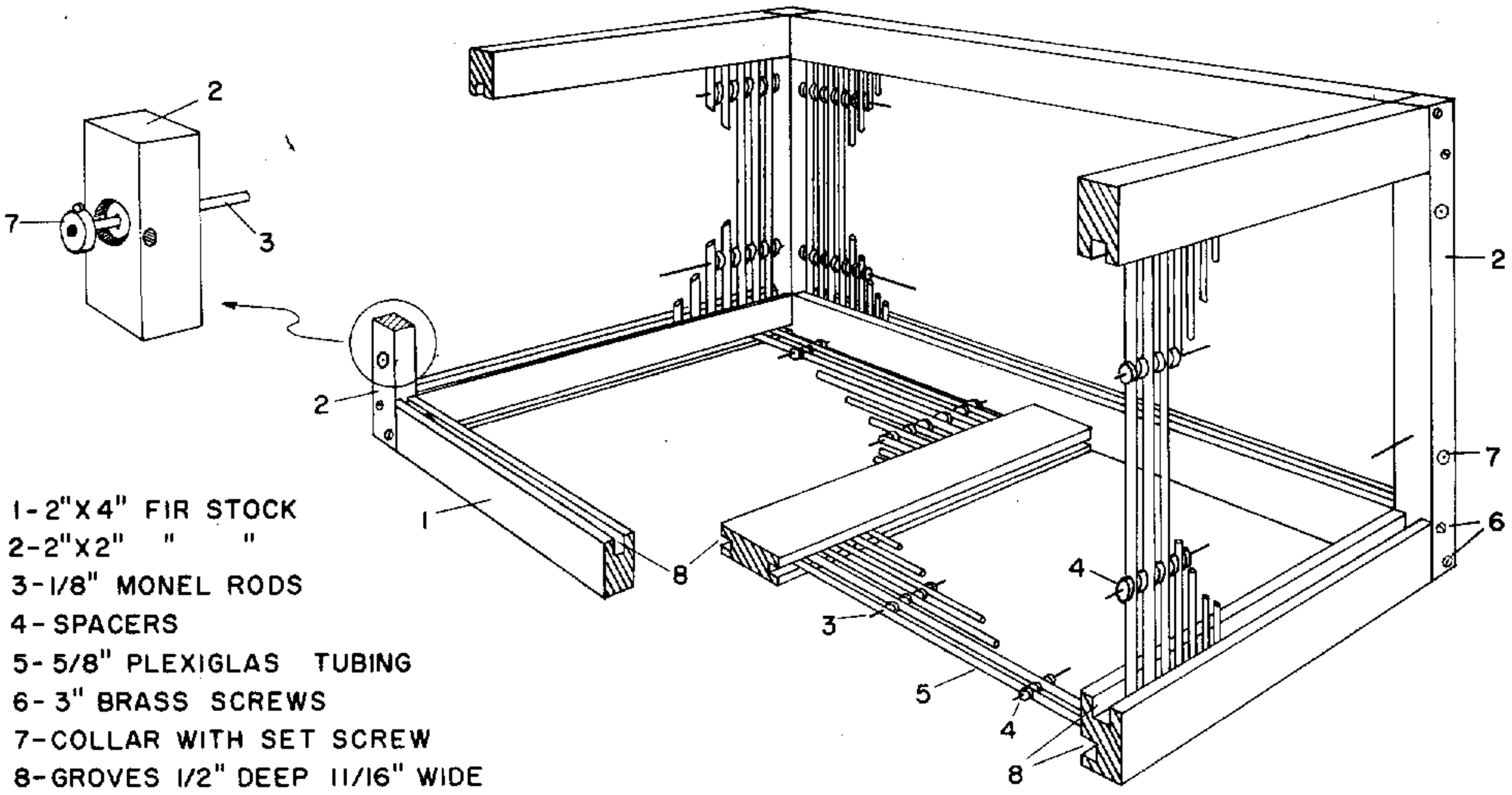

FIGURE 2.--Details of separator construction.

shrimp which escape the second separator will fall within the selected size range and can be held in the tank until they are marked.

Construction of Separators

The frame of each separator is constructed of fir, the vertical and horizontal pieces being made of 2x2 and 2x4 stock, respectively. Where necessary, the frame members are grooved to accommodate the ends of 5/8-inch Plexiglas tubes (figure 2). On the sides and bottom of each separator, 1/8-inch monel rods, passing perpendicularly through the frame members and tubes, lend rigidity to the latter and provide a means for spacing them (figure 3). These rods should not be more than 6 or 7 inches apart to insure maximum tube rigidity. Tubes are evenly spaced on the rods with loose-fitting brass or neoprene washers which are varied in number or thickness to obtain the desired spacing. Rods and tubes are secured within the framework by means of monel collars held with set screws at the ends of each

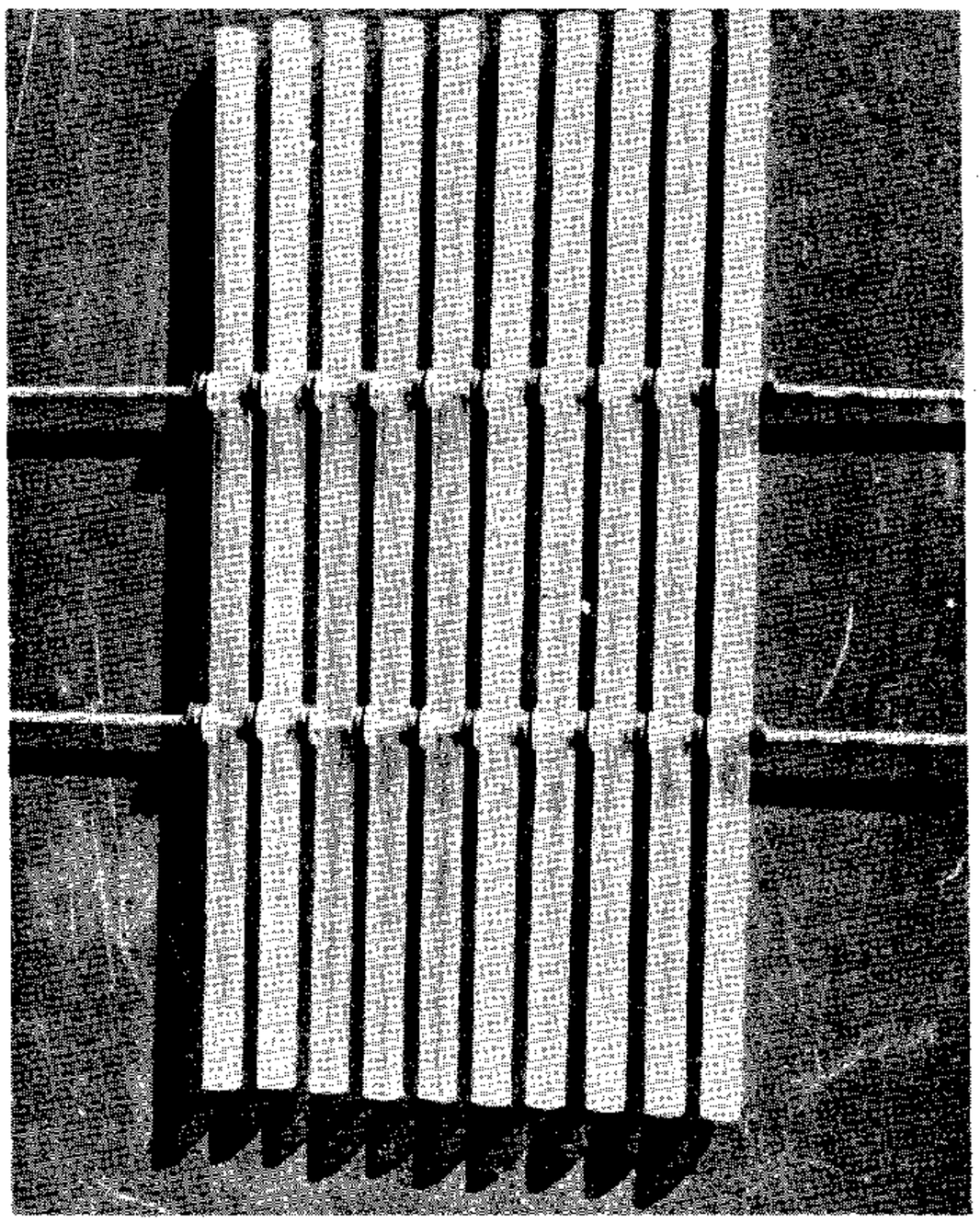

FIGURE 3.--Closeup showing arrangement of Plexiglas tubes on monel rods.

rod and countersunk in the outside of the frame's members. Small access holes in the frame permit tightening the set screws. Disassembly for adjustment of tube interspaces is facilitated by using screws (brass) to fasten the framework of the separator.

Dimensions of two separators found suitable for the grading of 6,000 to 15,000 shrimp daily were 38 by 28 by 24 inches, and 38 by 20 by 20 inches, respectively. The larger separator was usually used in first-stage sorting; and because this separator was therefore subject to greater abuse, tempered presswood was substituted for Plexiglas on two sides.

Field Results

To date, only pink shrimp, Penaeus duorarum, have been graded with these separators. Tube-spacing arrangements and corresponding sizes of the largest specimens that can readily pass through each are given below.

Tube spacing (inches)	Maximum size of escaping shrimp (carapace length[1] in millimeters)
5/32	8.9
7/32	14.1
9/32	16.7
11/32	20.5
13/32	25.2
15/32	29.7
17/32	32.5
19/32	35.7

[1] Distance on head from posterior margin of orbit in a line parallel to the rostral carina to the posterior margin of the cephalothorax.

In seeking ways to hasten sorting, Roppel and Weaver (1959) observed that salmon fry escaped grading devices at a greater rate when the fry were crowded. Similarly, the process of grading shrimp can be accelerated if high concentrations are maintained in the separators. Moreover, maximum escapement will occur through those sides of the separators receiving the most light, natural or artificial. Second-stage grading can, therefore, be expedited somewhat by fitting the holding tank with windows and introducing additional light. Undersize shrimp which do not escape within a reasonable period of time can be sorted out mechanically by lifting and shaking the separators.

Other Applications

In addition to serving the purposes of biological research, the grading method described here should also find application in the commercial bait-shrimp industry. Some modification of it might be used to eliminate the tedious hand-sorting of large bait shrimp, which, in many areas, command a higher price than small ones. For example, a small section of a conventional bait-shrimp holding tank could be partitioned off by a fence of properly spaced Plexiglas tubes. If crowded and given appropriate lighting, unsorted shrimp placed in the partitioned section would soon separate, the larger shrimp being retained there, the smaller shrimp escaping.

Literature Cited

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1956. A new mechanically adjustable multi-size fish-grader. Prog. Fish-Cult. 18 (2): 62-66.

Roppel, Alton Y., and Charles R. Weaver
1959. A device for separating salmon fry of unequal size. Ecol. 40 (1): 158.

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